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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/576,724	12/13/2006	Laurent Labrousse	289855US0PCT	4385

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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.  
1940 DUKE STREET  
ALEXANDRIA, VA 22314

EXAMINER
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LIAO, DIANA J

ART UNIT	PAPER NUMBER
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1793

NOTIFICATION DATE	DELIVERY MODE
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12/26/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/576,724	<b>Applicant(s)</b> LABROUSSE ET AL.	
	<b>Examiner</b> DIANA J. LIAO	<b>Art Unit</b> 1793	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period **will** apply and **will** expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply **will**, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 03 October 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 14-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-11,13 and 20 is/are rejected.
- 7) ☒ Claim(s) 3 and 12 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date: _____.                                     |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/21/2006, 7/11/2006</u> .                                    | 6) <input type="checkbox"/> Other: _____.                         |

**DETAILED ACTION**

***Election/Restrictions***

1. Applicant's election with traverse of claims 1-13 and 20 in the reply filed on 10/3/2008 is acknowledged. The traversal is on the ground(s) that distinctness has not been determined and that there is no search burden. This is not found persuasive because as stated in the original lack of unity, the common technical feature of the groups has been found not to be expected to overcome the prior art and thus a lack of unity exists. A search burden also exists because the broadest product claim does not require barium or strontium titanate and thus the process and product claims may be under different fields of search.

The requirement is still deemed proper and is therefore made FINAL.

2. Claims 14-19 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected inventions, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 10/3/2008.

***Priority***

3. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in parent Application No. 0350729 (France), filed on 10/23/2003.

***Information Disclosure Statement***

4. The information disclosure statement (IDS) submitted on 4/21/2006 and 7/11/2006 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 9 recites the limitation "TiO<sub>2</sub> base layer". There is insufficient antecedent basis for this limitation in the claim. For purposes of examination, examiner interprets this as the TiO<sub>2</sub>-based layer recited in claim 1.

7. Claim 20 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 20 discusses the "faces" of a structure which are not defined. The "structure" may be planar but can also be spherical and thus not have defined faces. Claim 20 also is a "glazing" comprising the structure of claim 1, which already includes a substrate. It is unclear if the substrate is somehow part of the coating (e.g. it is a thin or malleable substrate) or if the glazing refers only to the layered structure of the films.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. Claims 1, 2, 4-11, 13 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi, et al. ("Photocatalytic properties of TiO<sub>2</sub>/WO<sub>3</sub> bilayers..." 2003) in view of Zeman, et al. ("Nano-scaled photocatalytic TiO<sub>2</sub>..." 2003), Zhang, et al. ("Surface modification of TiO<sub>2</sub> film by iron doping..." 2003) and Doushita, et al. (US 6,576,344).

Takahashi, et al. teaches a deposited TiO<sub>2</sub> film possessing photocatalytic properties. The layers are deposited at room temperature by sputtering onto glass-slide substrates. WO<sub>3</sub> is deposited first to a thickness of 0.9-3.5 µm. A TiO<sub>2</sub> film is then deposited onto the WO<sub>3</sub> film. Photocatalytic properties have been confirmed. (pg 1410, Experimental Procedure)

Takahashi, et al. does not teach the mechanics of the layer deposition to be exactly as claimed, but since this is a product claim and the article of the prior art has an underlayer and an overlayer created without heating (at room temperature) with an achieved photocatalytic property, the limitations are found to be met. As will be discussed later, the anatase phase and an anti-soiling property are found to have been inherently met through the use of magnetron sputtering and also with the presence of photocatalytic ability.

Takahashi, et al. does not teach an underlayer with a thickness between 10 and 100 nm. Takahashi, et al. also does not mention that the glass substrate contains an additional layer below the underlayer. Takahashi, et al. also does not teach an overlayer. Takahashi, et al. also does not teach the use of dopants in the TiO<sub>2</sub>-based layer.

Regarding the thickness of the films, Zeman, et al. teaches the creation of photocatalytic TiO<sub>2</sub> films by magnetron sputtering. Zeman, et al. teaches that a film with a thickness below 100nm with photocatalytic ability is desirable because it would cut down production time. Magnetron sputtering is a slow process and thus creating a thin film would be significantly faster than creating a thicker film. (pg. 57)

One would be motivated to create thinner films because Zeman, et al. teaches that a thin film can still be rendered photocatalytic or useful and that it would take significantly less time due to the slow nature of magnetron sputtering. Therefore, due to

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slow speed at which sputtering creates a film, it would have been obvious to one of ordinary skill in the art to create as thin a film as effectively possible in order to save time, including the underlayer, which Takahashi, et al. teaches to be also created by sputtering.

Regarding the use of a dopant such as N, Fe, or Zr, Zhang, et al. teaches the effects of iron doping on the properties of a sputtered TiO<sub>2</sub> film. In certain applications, Fe-doped TiO<sub>2</sub> films have been found to have higher activity than pure TiO<sub>2</sub> films. (pg 337, Conclusions) One of ordinary skill would have been motivated to incorporate iron into the TiO<sub>2</sub> film since it is known in the art that at least in certain applications, an increase in photocatalytic ability can be achieved by a limited amount.

Regarding an overlayer and an alkali-blocking sublayer adjacent to the underlayer, Doushita '344 teaches a photocatalytic article with anti-soiling properties containing a metal oxide semiconductor and one other element, with an overcoat layer of titanium oxide. (claim 17) A preferred metal oxide semiconductor is TiO<sub>2</sub> because it is high in catalytic activity and stable. (col 3, lines 41-48) The substrate is preferably glass with an alkali-blocking film. (claim 13) Doushita '344 is found to fairly teach that a photocatalytic article such as TiO<sub>2</sub> inherently has an anti-soiling capability because Doushita '344 teaches anti-soiling articles with the only guidance being providing a photocatalytic layer.

One would have been motivated to add an overlayer as taught in Doushita '344 because an overlayer is found to improve the anti-fogging and anti-soiling functions of the photocatalyst layer. (col 10, lines 20-24) One would have been motivated to include an alkali blocking film because Doushita '344 teaches that when a glass substrate is used, such as in Takahashi, et al., an alkali-blocking film should be employed in order to prevent the migration of alkali ions which would affect the crystallinity and thus photocatalytic ability of the titanium oxide. (col 4, lines 18-31)

One of ordinary skill in the art would have been motivated to combine the teachings of Doushita '344 with that of Takahashi, et al. because of the similar applications as photocatalysts, in both UV and visible light spectra.

Regarding an additional sublayer to the underlayer having a functionality, it would have been obvious to one of ordinary skill in the art to incorporate additional layers depending on the intended use. Doushita '344 recites many uses for photocatalytic films, such as air conditioner heat exchanger fins (which may require a thermal control or conducting layer), and mirrors and lenses (which may require an optical functionality). (col 1, lines 12-27) Therefore, the addition of an additional layer below the underlayer and TiO<sub>2</sub>-based layer is not found patentable over the prior art. All additional layers are also not found to interfere with the anti-soiling abilities, as Doushita '344 only teaches the extra layers to enhance the ability.



Regarding a glazing or a coating incorporating a  $\text{TiO}_2$ -based antisoiling layer and underlayer and possibly including at least one other layer on another external face, it would have been obvious to one of ordinary skill in the art to use the glazing on all appropriate surfaces of a structure depending on the intended use. As in the case of catalysis, if the reaction occurring involves compounds in the environment, as in a liquid or gas environment such as the treatment of water, it would have been obvious to one of ordinary skill in the art to use the glazing on all possible faces of the structure in order to increase catalytic surface area.

Regarding the creation of an anatase layer, the prior art appears to show that the creation of an anatase phase is inherent in the use of magnetron sputtering, especially when creating a layer with photocatalytic ability. Both Zeman, et al. and Zhang, et al. teach the creation of anatase films (see respective abstracts) and do not discuss the creation of any other phase when creating the film using magnetron sputtering. In addition, Zeman, et al. teaches that the most photoactive phase is anatase (pg 57, Introduction), and thus it would have been obvious to one of ordinary skill in the art to use known means to achieve anatase phase  $\text{TiO}_2$ . Therefore, the creation of anatase phase titanium oxide in Takahashi, et al. is found to be inherent since a film of a different crystallinity would not be effectively photocatalytic, or alternatively the creation of anatase phase is the most desired phase.

Therefore, due to the motivation to create an effective photocatalyst layer, through the use of dopants or additional layers, claims 1, 2, 4-11, 13 and 20 are not found patentable over the prior art.

### ***Allowable Subject Matter***

11. Claims 3 and 12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art does not teach or suggest the use of a barium or strontium titanate as an underlayer to promote the growth of titanium oxide in the desired crystalline phase.

### ***Conclusion***

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. McKee, et al. (US 5,225,031); Saitoh, et al. (US 6,465,042); Zheng, et al. ("Photocatalytic activity study of TiO<sub>2</sub> thin film with and without Fe ion implantation" 2002).

Claims 1, 2, 4-11, 13 and 20 have been rejected. Claims 3 and 12 are objected to and contain allowable subject matter.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DIANA J. LIAO whose telephone number is (571)270-

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3592. The examiner can normally be reached on Monday - Friday 8:00am to 5:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/  
Primary Examiner, Art Unit 1793

DJL